14 Reference Infomation

14-1 Technical Terms

-TFT-LCD
Thin film Transistor Liquid Crystal Display

-ADC(Analog to Digital Converter)
This is a circuit that converts from analog signal to digital signals.

-PLL(Phase Locked Loop)
During progressing ADC, Device makes clock synchronizing HSYNC with Video clock

-Inverter
Device that supplies Power to LCD panel lamp. This device generates about 1,500~2,000V.

AC Adapter
Device that converts AC(90V~240V) to DC(+12V or 14V)

-SMPS(Switching Mode Power Supply)
Switching Mode Power supply. This design technol- ogy is used to step up/down the input power by switching on/off

-FRC(Frame Rate Controller)
Technology that changes the number of frames dis- played on screen per second.
TFT-LCD panel requires 60 frames per second. This technology is needed to convert input image to 60 frames per second regardless input frame quan- tity.

-Image Scaler
Technology that convert various input resolution to other resolution.(ex. 640* 480 to 1024*768)

-Auto Configuration(Auto adjustment)
This is an algorithm to adjust monitor to optimum condition by pushing one key.

-OSD(On Screen Display)
Customers can easily control the screen settings using the OSD.

-FINE
The "Fine" adjustment is used to adjust visibility by controlling phase difference.

-COARSE
This adjustment adjusts the display by tuning Video clock and PLL clock.

-L.V.D.S.(Low Voltage Differential Signaling)
A kind of transmission method for Digital. It can be used from Main PBA to Panel.

-DDC(Display data channel)
It is a communication method between a Host Computer and related equipment. It enables Plug and Play between PC and
Monitor.

-EDID
Extended Display Identification Data PC can recog- nize monitor information, such as Product data, Product name, Display mode, Serial number, Signal source, etc. Data is recognized via DDC Line linking PC and Monitor.

-Dot Pitch
The image on a monitor is composed of red, green and blue dots. The closer the dots, the higher the resolution. The distance between two dots of the same color is called the 'Dot Pitch'. Unit: mm

-Vertical Frequency
The screen must be redrawn several times per sec- ond in order to create and display an image for the user. The frequency of this repetition per second is called Vertical Frequency or Refresh Rate. Unit: Hz Example: If the same light repeats itself 60 times per second, this is regarded as 60 Hz.

-Horizontal Frequency
The time to scan one line connecting the right edge to the left edge of the screen horizontally is called Horizontal Cycle. The inverse number of the Horizontal Cycle is called Horizontal Frequency. Unit: kHz

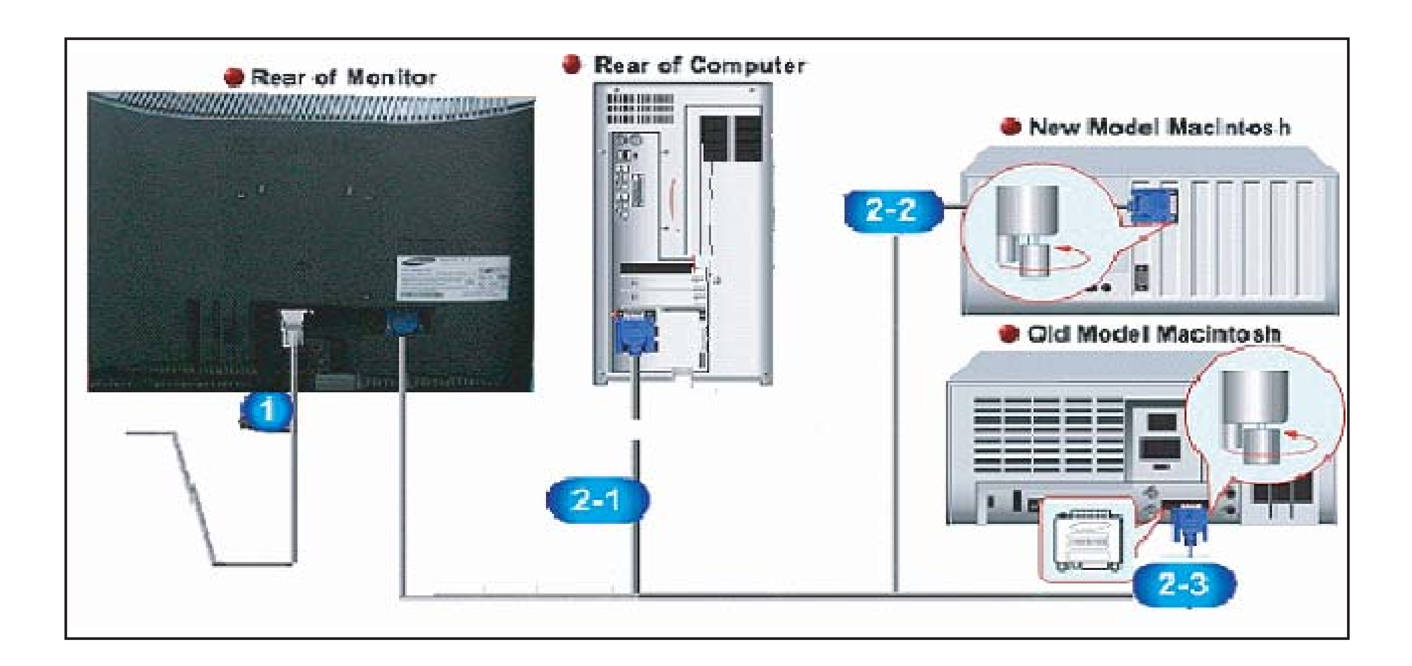
-Interlace and Non-Interlace Methods
Showing the horizontal lines of the screen from the top to the bottom in order is called the Non-Interlace method while showing odd lines and then even lines in turn is called the Interlace method. The Non- Interlace method is used for the majority of monitors to ensure a clear image. The Interlace method is the same as that used in TVs.

-Plug & Play
This is a function that provides the best quality screen for the user by allowing the computer and the monitor to exchange information automatically. This monitor follows the international standard VESA DDC for the Plug & Play function.

-Resolution
The number of horizontal and vertical dots used to compose the screen image is called 'resolution'. This number shows the accuracy of the display. High resolution is good for performing multiple tasks as more image information can be shown on the screen.

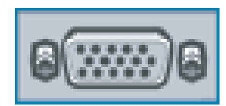
Example: If the resolution is 1280 x 1024 , this means the screen is composed of 1280 horizontal dots (horizontal resolution) and 1024 vertical lines (vertical resolution).

14-2 Connecting the monitor



1. Connect the power cord for your monitor to the power port on the back of the monitor. Plug the power cord for the monitor into a nearby outlet.

2-1. Using the D-sub (Analog) connector on the video card.
Connect the signal cable to the 15-pin, D-sub connector on the back of your monitor.



2-2. Connected to a Macintosh.
Connect the monitor to the Macintosh computer using the D-SUB connection cable.

2-3. In the case of an old model Macintosh, you need to connect the monitor using a special Mac adapter.

3. Turn on your computer and monitor. If your monitor displays an image, installation is complete.

14-3 Pin Assignments

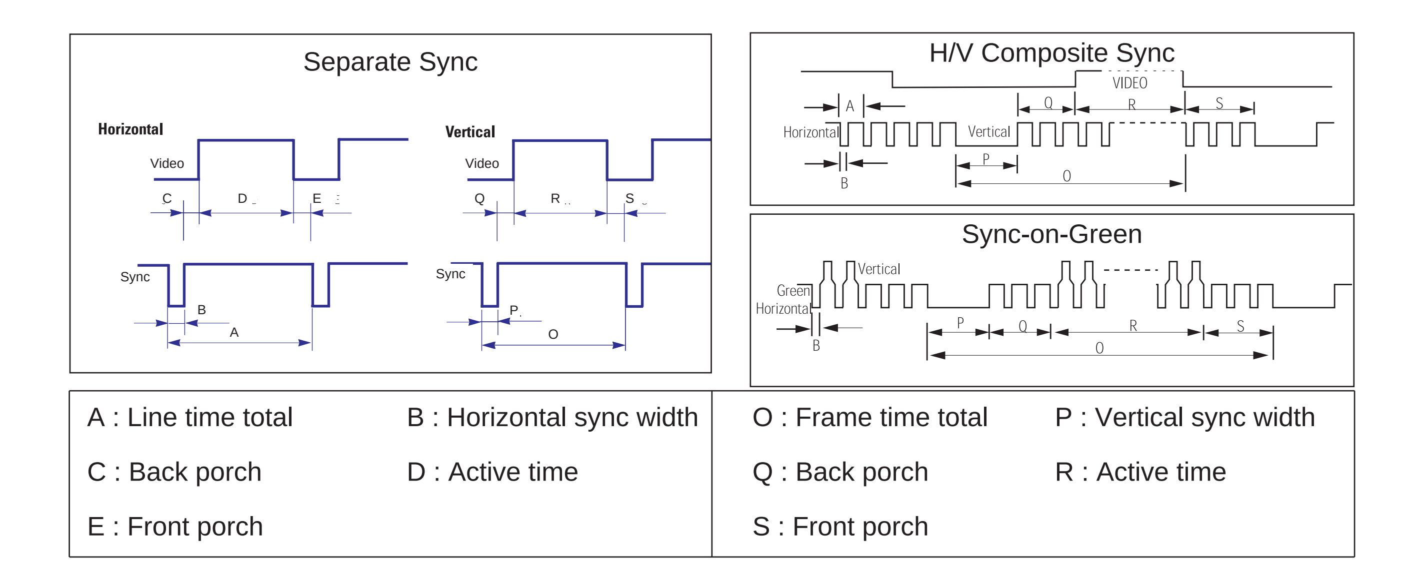
Sync Type / Pin No.	15-Pin D-Sub Signal Cable Connector	
	Separate	Sync-on-green
1	Red	Red
2	Green	Green + H/V Sync.
3	Blue	Blue
4	NC	NC
5	DDC Return (GND)	DDC Return (GND)
6	GND-R	GND-R
7	GND-G	GND-G
8	GND-B	GND-B
9	NC	NC
10	Cable Detect	Cable Detect
11	NC	NC
12	Bi-Dr Data (SDA)	Bi-Dr Data (SDA)
13	H-Sync.	Not Used
14	V-Sync.	Not Used
15	DDC Clock (SCL)	DDC Clock (SCL)

14-4 Timing Chart

- This section of the service manual describes the timing that the computer industry recognizes as standard for computer-generated video signals.

Table 1 Timing Chart

No	Name	Timing ID	dot_clk (MHz)	h_freq (kHz)	v_freq (Hz)
1	IBM 640*350/70Hz	640*350/70Hz	25.175	31.469	70
2	IBM 720*400/70Hz	720*400/70Hz	28.322	31.469	70
3	IBM 640*480/60Hz	640*480/60Hz	25.175	31.469	60
4	MAC 640*480/67Hz	640*480/67Hz	30.240	35.000	66.7
5	VESA 640*480/72Hz	640*480/72Hz	31.500	37.861	72
6	VESA 640*480/75Hz	640*480/75Hz	31.500	37.500	75
7	VESA 800*600/56Hz	800*600/56Hz	36.000	35.156	56
8	VESA 800*600/60Hz	800*600/60Hz	40.000	37.879	60
9	VESA 800*600/72Hz	800*600/72Hz	50.000	48.077	72
10	VESA 800*600/75Hz	800*600/75Hz	49.500	46.875	75
11	MAC 832*624/75Hz	832*624/75Hz	57.284	49.726	75
12	VESA 1024*768/60Hz	1024*768/60Hz	65.000	48.363	60
13	VESA 1024*768/70Hz	1024*768/70Hz	75.000	56.476	70
14	VESA 1024*768/75Hz	1024*768/75Hz	78.750	60.023	75
15	VESA 1152*864/75Hz	1152*864/75Hz	108.000	67.500	75
16	MAC 1152*870/75Hz	1152*870/75Hz	100.000	68.681	75
17	VESA 1280*1024/60Hz	1280*1024/60Hz	108.000	63.981	60
18	VESA 1280*1024/75Hz	1280*1024/75Hz	135.000	79.976	75



14-5 Preset Timing Modes

- If the signal transferred from the computer is the same as the following Preset Timing Modes, the screen will be adjusted automatically. However, if the signal differs, the screen may go blank while the power LED is on. Refer to the video card manual and adjust the screen as follows.

TIMING	FH(KHZ) FV(HZ)	SYNC POLARITY	TOTAL (DOT/LINE)	ACTIVE (DOT/LINE)	SYNC WIDTH (DOT/LINE)	FRONT PORCH (DOT/LINE)	BACK PORCH (DOT/LINE)	PIXEL FOREQ .(MHZ)
IBM	31.469	+	800	640	96	8	40	25.175
640*350@70Hz	70	–	449	350	2	31	54	
IBM	31.469	-	900	720	108	9	45	28.322
720*400@70Hz	70	+	449	400	2	6	27	
IBM	31.469	-	800	640	96	8	40	25.175
640*480@60Hz	60	-	525	480	2	2	25	
MAC	35	-	864	640	64	64	96	30.24
640*480@67Hz	66.7	-	525	480	3	3	39	
VESA	37.861	-	832	640	40	16	120	31.5
640*480@72Hz	72	-	520	480	3	1	20	
VESA	37.5	-	840	640	64	16	120	31.5
640*480@75Hz	75	-	500	480	3	1	16	
VESA	35.156	+	1024	800	72	24	128	36
800*600@56Hz	56	+/-	625	600	2	1	22	
VESA	37.879	+	1056	800	128	40	88	40
800*600@60Hz	60	+	628	600	4	1	23	
VESA	48.077	+	1040	800	120	56	64	50
800*600@72Hz	72	+	666	600	6	37	23	
VESA	46.875	+	1056	800	80	16	160	49.5
800*600@75Hz	75	+	625	600	3	1	21	
MAC	49.726	-	1152	832	64	32	224	57.284
832*624@75Hz	75	-	667	632	3	1	39	
VESA	48.363	-	1344	1024	136	24	160	65
1024*768@60Hz	60	-	806	768	6	3	29	
VESA	56.476	-	1328	1024	136	24	144	75
1024*768@70Hz	70	-	806	768	6	3	29	
VESA	60.023	+	1312	1024	96	16	176	78.75
1024*768@75Hz	75	+	800	768	3	1	28	
VESA	67.5	+	1600	1152	128	64	256	108
1152*864@75Hz	75	+	900	864	3	1	32	
MAC	68.681	-	1456	1152	128	32	144	100
1152*870@75Hz	75	-	915	870	3	3	39	
VESA	63.981	+	1688	1280	112	48	248	108
1280*1024@60Hz	60	+	1066	1024	3	1	38	
VESA	79.976	+	1688	1280	144	16	248	135
1280*1024@75Hz	75	+	1066	1024	3	1	38	

Horizontal Frequency
The time to scan one line connecting the right edge to the left edge of the screen horizontally is called Horizontal Cycle and the inverse number of the Horizontal Cycle is called Horizontal Frequency. Unit: kHz

Vertical Frequency
Like a fluorescent lamp, the screen has to repeat the same image many times per second to display an image to the user. The frequency of this repetition is called Vertical Frequency or Refresh Rate. Unit: Hz

14-6 Panel Description

Maker	VENDOR P/N	PANEL_CODE	PANEL_ABB	STICKER_CODE	Remarks
INL	631102071830r				LCD PANEL 17" MT170EN01
CPT	631102070680r				LCS PANEL 17" CLAA170EA07Q(CPT)

Memo